

Amendment
Serial No. 09/891,611
Attorney Docket No. 010817

REMARKS

Claims 105-108, 110-119, 121, 122, 124-130, 136-140, 142-144, 146, 148 and 150 are pending. Claims 105, 114, 116, 118, 125, 127-128, 130, 136-138, 140, 146 and 148 are hereby amended and new claim 150 has been added.

Claims 114 and 115 were rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,892,224 to Nakasuji. Favorable reconsideration of this rejection is earnestly solicited.

It is a very important matter in designing of an apparatus using a plurality of beams how many beams can be made by a single optical system. The Office Action states that Nakasuji teaches that the positions at which the plurality of charged particles are irradiated are separated enough that the secondary charged particles generated by each beam will only be incident on the detector designated for that beam (page 3 of the Action). Nakasuji only teaches a means for preventing the secondary charged particles from entering into neighboring detectors. Nakasuji does not teach how small the interval can be made concretely.

To the contrary, the inspection apparatus defined in claim 114 comprises a feature "wherein the plurality of the charged particle beams are irradiated each around said optical axis at a position separated larger than a distance resolution of the secondary optical system". The above feature of claim 114 limits a concrete physical amount easily obtainable by a simulation or an actual measurement, and limits how small the interval can be made. Further, Nakasuji does

Amendment
Serial No. 09/891,611
Attorney Docket No. 010817

not refer to the terms of "a distance resolution of the secondary optical system". Decrease of the intervals is very important technology to obtain a high throughput using multi-beams.

Claims 105, 113, 116-119, 124, 125, 127-130, 143, 144 and 146 were rejected under 35 U.S.C. 103(a) as being unpatentable over Nakasuji in view of U.S. Patent No. 4,954,705 to Brunner et al. Favorable reconsideration of this rejection is respectfully requested.

Claim 105 is amended to specify "at least one lens and a deflector between the separator and the detectors". The applicant believes that the limitation of "at least one lens and a deflector between the separator and the detectors" in claims 105 and 113 is neither disclosed nor suggested by Nakasuji and/or Brunner et al.

Each of claims 116 and 117 is dependent on claim 114. Thus, claims 116 and 117 are patentable over Nakasuji and/or Brunner et al. for the same reasons discussed above.

Claim 118 and claim 119 (depending on claim 118) are believed to be patentable since claim 118 is currently amended so as to include the limitation of "wherein said separator is disposed between the objective lens and a neighbor lens of said objective lens at the side of a beam source" which is neither disclosed nor suggested by Nakasuji and/or Brunner et al.

The apparatus defined in claim 124 has a limitation "wherein the secondary charged particles are separated from the primary charged particle beams after they pass through the objective lens before they enter to the next lens" (last two lines of claim 124). This limitation is an important to make the common path of the primary and secondary beams as small as possible

Amendment
Serial No. 09/891,611
Attorney Docket No. 010817

so as to minimize the blur of the primary beam caused by space charge effect. Nakasuji or Brunner et al. neither discloses nor suggests such limitation. Accordingly, claim 124 is patentable over Nakasuji and Brunner et al.

Claim 125 and claim 129 (depending on claim 125) are believed to be patentable since claim 125 is currently amended so as to include the limitation of "through a secondary optical system having at least one stage lens and one stage deflector between the separator and the detectors" which is neither disclosed nor suggested by Nakasuji and/or Brunner et al.

Claim 127 is believed to be patentable since claim 127 is currently amended so as to include the limitation of "wherein said single aperture plate is disposed around a beam source image" which is neither disclosed nor suggested by Nakasuji and/or Brunner et al.

Claim 128 is believed to be patentable since claim 128 is currently amended so as to include the limitation of "wherein said single aperture plate is disposed around a beam source image" which is neither disclosed nor suggested by Nakasuji and/or Brunner et al.

Claim 130 is believed to be patentable since claim 130 is currently amended so as to include the limitation of "wherein the positions in a plane perpendicular to the optical axis of the plurality of apertures are disposed so as to correct a distortion of the primary optical system" which is neither disclosed nor suggested by Nakasuji and/or Brunner et al.

Claim 143 defines an inspection method (4100) using "a single beam source with multiple emitting cathodes". The single beam source of claim 143 has a simple structure, forms a

Amendment
Serial No. 09/891,611
Attorney Docket No. 010817

plurality of beams, and provides many advantageous effects, and is not considered to be obvious to one of ordinary skill from Nakasuji and/or Brunner et al.

Claim 144 defines an inspection method (4100) using "a beam source with multiple emitting cathodes ". It is believed that none of the references cited in the action discloses "a beam source with multiple emitting cathodes" as cited in claim 144.

Claim 146 is believed to be patentable since claim 146 is currently amended so as to include the limitation of "by a separator disposed between the objective lens and a neighbor lens of said objective lens at the side of the beam source".

Claims 106-108 and 111 were rejected under 35 U.S.C. 103(a) as being unpatentable over Nakasuji in view of Brunner et al. and further in view of U.S. Patent No. 6,344,750 to Lo et al. (page 8 of the Action). Favorable reconsideration of this rejection is respectfully requested.

Each of claims 106-108 and 111 depends directly or indirectly on claim 105 and includes further limitations. Neither Nakasuji nor Brunner et al. discloses the limitation "at least one lens and a deflector between the separator and the detectors" of claim 105. Lo et al. does not disclose the above limitation, too. Accordingly, dependent claims 106-108 and 111 are patentable over Nakasuji, Brunner et al. and Lo et al.

Claims 110 and 112 were rejected under 35 U.S.C. 103(a) as being unpatentable over Nakasuji, Brunner et al., and Lo et al. and further in view of U.S. Patent No. 4,911,103 to Davis et al. (page 10 of the Action). Favorable reconsideration of this rejection is respectfully requested.

Amendment
Serial No. 09/891,611
Attorney Docket No. 010817

Each of claims 110 and 112 depends indirectly on claim 105 and includes further limitations. Therefore, claims 110 and 112 are patentable at least by the same reason as claim 105 explained above.

Claims 114, 121, 122 and 142 were rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,430,292 to Honjo et al. (page 11 of the Action). This rejection is respectfully traversed.

The inspection apparatus defined in claim 114 is currently amended and includes a limitation "wherein the plurality of the charged particle beams are irradiated each around said optical axis and" at a position separated by distance resolution of the secondary optical system". This limitation enables to make the resolution of the secondary optical system not more than one micrometer and to arrange multiple beams with intervals of 1 micrometer or less. It is possible by this limitation that a plurality of multi-beams is arranged by providing a primary optical system and a secondary optical system which greatly improve the throughput of the apparatus.

Honjo et al discloses a geometric arrangement of the converging electrode 630, the deflection electrode 631 and the detector 632 (Fig. 37) to prevent the reflected electrons of the adjacent beam from entering into the detector. However, by such arrangement of Honjo et al., it is not possible to shorten the beam distance less than W.D. (the distance between the deflector 631 and the sample) which is typically mm order. Further, the arrangement of Honjo et al. needs a converging electrode or a deflector for each beam and, considering a plurality of optical parts and their control sources to be made, its cost is very high. The applicant considers that the above

Amendment
Serial No. 09/891,611
Attorney Docket No. 010817

limitation in claim 114 is very important to realize a multi-beam apparatus, and is patentable over Honjo et al. The applicant has not found the following description which was stated in page 13 of the Action as another embodiment taught by Honjo et al.

"At line 63 in column 9 through line 21 in column 10, Honjo et al. teaches that the plurality of charged particle beams can be formed by directing a primary beam (B) through an aperture plate having a plurality of apertures adapted to form a plurality of charged particle beams, the beams being formed by containing particles generated by the beam generating means to form irradiation points disposed in rows N in a direction of transferring the sample and in columns M in a direction perpendicular to the direction of transferring the sample, and the apertures are located within a range of a predetermined electron density of the charged particles emitted from the beam generating means".

Claim 121 and its subsidiary claim 122 recite the feature "the plurality of apertures is located within a range of a predetermined current density of the charged particles emitted from the beam source". This feature is not disclosed by Honjo et al. and, therefore, claims 121 and 122 are not anticipated by Honjo et al. The Examiner stated at page 12 lines 12-20 of the Action that the above feature is disclosed by Honjo et al. However, Honjo et al. only discloses "electron beam generating units can be arranged in a single dimensional direction or in two dimensional directions (column 9 lines 30-32). What is disclosed in Figs. 10a and 10b is "B1, B2, B3, B4 - - Bn are irradiated simultaneously" (column 9 lines 40-41), "each individual electron beam generating unit 25 may be designed to scan its respective electron beam B1, B2, over a

Amendment
Serial No. 09/891,611
Attorney Docket No. 010817

predetermined region by the deflection electrode 103" (column 9 lines 49-52), and "an electron beam injected from the electron gun 21 and having an uniform diameter formed by the optical system 22 is caused to pass through a predetermined number of electron beam" (column 10 lines 49-52).

Claim 142 recites the feature "wherein the primary charged particle beams to the sample are irradiated with each spaced by a distance greater than a distance resolution of the secondary optical system". This feature of claim 142 is almost the same as the feature of claim 114 mentioned above. Accordingly, claim 142 is patentable over Honjo et al. for the same reason as claim 114.

Claim 136 was objected to as being dependent upon a rejected base claim. Claim 136 is currently amended to be an independent claim.

For at least the foregoing reasons, the claimed invention distinguishes over the cited art and defines patentable subject matter. Favorable reconsideration is earnestly solicited.

Should the Examiner deem that any further action by applicants would be desirable to place the application in condition for allowance, the Examiner is encouraged to telephone applicants' undersigned attorney.

Amendment
Serial No. 09/891,611
Attorney Docket No. 010817

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP



Stephen G. Adrian

Attorney for Applicants
Registration No. 32,878
Telephone: (202) 822-1100
Facsimile: (202) 822-1111

SGA/arf

Attachment: Petition for Extension of Time